

CLAIMS

What is claimed is:

1. A covering for an architectural opening comprising:
 - a head rail assembly;
 - at least one sheet of fabric;
 - a head roller rotatably supported by said head rail assembly and adapted to extend or retract said at least one sheet upon rotation of said head roller in a first direction or a second direction;
 - a control system connected with said head rail assembly and adapted to rotate said head roller in said first direction and said second direction, said control system comprising:
 - an input assembly including a single operating element and operative to convert linear motion of said operating element into rotational motion of a first motion transfer element;
 - a transmission operative to translate rotation of said first motion transfer element into rotation of a second motion transfer element;
 - an output assembly operatively engaged with said second motion transfer element to rotate said head roller; and
 - wherein a pull force applied in a first pull direction imparted on said single operating element causes said head roller to rotate in said first direction, and said pull force applied in a second pull direction imparted on said single operating element causes said head roller to rotate in said second direction.
2. The covering of claim 1, wherein said first motion transfer element is a first gear, and said second motion transfer element is a second gear.
3. The covering according to claims 1 or 2, wherein said input assembly further comprises:
 - a spool;
 - a pulley;
 - a shift arm;
 - a guide control arm; and
 - wherein said single operating element extends from said spool, partially around said

pulley, across said shift arm, and exits said head rail assembly through said guide control arm.

4. The covering of claim 3, wherein said pulley is rotatably supported by said shift arm; and

wherein friction between said pulley and said shift arm causes said shift arm to pivot when said pull force is applied to said single operating element.

5. The covering of claim 4, wherein said shift arm includes a first leg portion and a second leg portion;

wherein said first leg portion is adapted to engage said transmission to control a rotational direction of said head roller; and

wherein said second leg portion is adapted to operatively engage said single operating element such that while said pull force is being applied to said single operating element, changing direction of said pull force from said first pull direction to said second pull direction does not cause said head roller to rotate in said second direction.

6. The covering of claim 5, wherein a pawl extends from said first leg portion to engage said transmission.

7. The covering of claim 6, wherein a boss extends from said second leg portion to operatively engage said single operating element.

8. The covering claim 2, wherein said input assembly further comprises:

a spool;

a shift arm;

a guide control arm; and

wherein said single operating element extends from said spool, across said shift arm, and exits said head rail assembly through said guide control arm.

9. The covering of claim 8, wherein said shift arm is pivotally connected with said head rail assembly; and

wherein said pull force imparted on said single operating element in said first pull direction causes said shift arm to pivot and engage said transmission, causing said head roller to rotate in said first direction.

10. The covering of claim 8, said input assembly further comprising a spring operatively connected with said spool to automatically wind said single operating element onto said spool.

11. The covering of claim 10, the wherein said single operating element is defined by an operating cord connected with a pull cord through a coupler;

wherein said operating cord extends from said spool, across said shift arm, and exits said head rail assembly through an opening on guide control arm; and

and wherein said coupler is adapted to engage said opening on said guide control to prevent said pull cord from entering said opening.

12. The covering of claim 11, wherein said opening on said guide control arm is configured to engage said coupler to place said operating cord in a first position relative to said shift arm;

wherein said first position of said operating cord relative to said shift arm allows placement of said operating cord in a first cord path across said shift arm when said pull force in said first direction is imparted on said single operating element in said first pull direction; and

wherein said first position of said operating cord relative to said shift arm allows placement of said operating cord in a second cord path across said shift arm when said pull force in said second direction is imparted on said single operating element in said second pull direction.

13. The covering of claim 12, wherein said operating cord engages said shift arm to allow said shift arm to engage said transmission to control a rotational direction of said second gear when said operating cord is placed in said first cord path across said shift arm.

14. The covering of claim 12, wherein said operating cord engages said shift arm to prevent said shift arm from engaging said transmission to control a rotational direction of said second gear when said operating cord is placed in said first cord path across said shift arm.

15. The covering of claim 11, wherein said coupler is defined by a first coupler portion connected with said operating cord, and a second coupler portion connected with said pull cord;

wherein said first coupler portion is releasably connected with said second coupler

portion; and

wherein said coupler is configured to allow separation of said first coupler portion from said second coupler portion at a predetermined tension applied to said single operating element.

16. The covering of claim 1, the wherein said single operating element is defined by an operating cord connected with a pull cord through a coupler;

wherein said coupler is defined by a first coupler portion connected with said operating cord, and a second coupler portion connected with said pull cord;

wherein said first coupler portion is releasably connected with said second coupler portion; and

wherein said coupler is configured to allow separation of said first coupler portion from said second coupler portion at a predetermined tension applied to said single operating element.

17. The covering of claim 2, said transmission further comprising:

a clutch selectively rotatably connecting said first gear with said second gear; and
at least one third gear rotatably connecting said first gear with said second gear.

18. The covering of claim 17, wherein said pull force applied in said first pull direction to said single operating element causes said first gear to rotate in said first direction, and wherein said first gear engages said at least one third gear to cause rotation of said second gear in said second direction; and

wherein said pull force applied in said second pull direction to said single operating element causes said first gear to rotate in said first direction, and wherein said first gear engages said at least one third gear to activate said clutch to cause rotation of said second gear in said first direction.

19. The covering of claim 18, wherein said clutch is configured to allow rotation of said second gear in said first direction and second direction when said clutch is deactivated.

20. The covering of claim 18, wherein said clutch comprises:

a clutch body having an open center adapted to receive an axle to rotatably support said clutch;

at least one leg connected with said clutch body; and

wherein said at least one third gear is adapted to engage said at least one leg to activate said clutch when said at least one third gear rotates in said first direction; and

wherein said at least one third gear is adapted to disengage from said at least one leg to activate said clutch when said at least one third gear rotates in said second direction.

21. The covering of claim 20, wherein a first frictional force between said clutch body and said axle prevents rotation of said body relative to said axle until said at least one third gear engages said at least one leg to activate said clutch, and

wherein said first frictional force overcomes a second frictional force between said at least one third gear and said at least one leg to allow disengagement of said at least one third gear from said at least one leg.

22. The covering of claim 17, wherein said clutch is constructed from a thermoplastic polyester elastomer material.

23. The covering of claim 17, wherein said axle is constructed from a teflon filled polycarbonate.

24. The covering of claim 17, wherein said at least one third gear comprises at least one planet gear adapted to engage said first gear and said second gear;

wherein said planet gear is rotatably supported by a planet carrier to allow said planet gear to orbit about said axle; and

wherein said input assembly is adapted to engage said planet carrier to prevent rotation of said planet carrier when said pull force is applied to said single operating element in said first pull direction; and

wherein said input assembly is adapted to not engage said planet carrier to allow rotation of said planet carrier when said pull force is applied to said single operating element in said second pull direction.

25. The covering of claim 17, wherein said clutch is a step spring.

26. A covering for an architectural opening comprising:

a head rail assembly;

at least one sheet of fabric;

a head roller rotatably supported by said head rail assembly and adapted to extend or

retract said at least one sheet upon rotation of said head roller in a first direction or a second direction;

a control system connected with said head rail assembly and adapted to rotate said head roller in said first direction and said second direction, said control system comprising:

an input assembly including a single operating element and operative to convert linear motion of said operating element into rotational motion of a first motion transfer element;

a transmission operative to translate rotation of said first motion transfer element in said first direction into rotation of a second motion transfer element through at least one planet gear rotatably connected with a planet carrier;

an output assembly operatively engaged with said second motion transfer element to rotate said head roller; and

wherein said input assembly includes a braking element adapted to brake said planet carrier to cause rotation of said second motion transfer element in said second direction, and wherein said input assembly is adapted to release said planet carrier to cause rotation of said second motion transfer element in said first direction.

27. The covering of claim 26, wherein said first motion transfer element is a first gear, and said second motion transfer element is a second gear.

28. The covering according to claims 26 or 27, wherein said input assembly further comprises:

a spool;

a pulley;

a shift arm;

a guide control arm; and

wherein said single operating element extends from said spool, partially around said pulley, across said shift arm, and exits said head rail assembly through said guide control arm.

29. The covering of claim 28, wherein said pulley is rotatably supported by said shift arm; and

wherein friction between said pulley and said shift arm causes said shift arm to pivot when said pull force is applied to said single operating element.

30. The covering of claim 29, wherein said shift arm includes a first leg portion and a second leg portion;

wherein said first leg portion is adapted to engage said transmission to control a rotational direction of said head roller; and

wherein said second leg portion is adapted to operatively engage said single operating element such that while a pull force is being applied to said single operating element and while said head roller is rotating said first direction, changing direction of said pull force from a first pull direction to a second pull direction does not cause said head roller to rotate in said second direction.

31. The covering claim 27, wherein said input assembly further comprises:

a spool;

a shift arm pivotally connected with said head rail assembly;

a guide control arm;

wherein said single operating element extends from said spool, across said shift arm, and exits said head rail assembly through said guide control arm; and

wherein a pull force imparted on said single operating element in a first pull direction causes said shift arm to pivot and engage said transmission, causing said head roller to rotate in said first direction.

32. The covering of claim 31, said input assembly further comprising a spring operatively connected with said spool to automatically wind said single operating element onto said spool.

33. The covering of claim 27, said transmission further comprising:

a clutch selectively rotatably connecting said first gear with said second gear.

34. A covering for an architectural opening comprising:

a head rail assembly;

at least one sheet of fabric;

a head roller rotatably supported by said head rail assembly and adapted to extend or retract said at least one sheet upon rotation of said head roller in a first direction or a second direction;

a control system connected with said head rail assembly and adapted to rotate said

head roller in said first direction and said second direction, said control system comprising:

an input assembly including a single operating element and operative to convert linear motion of said operating element into rotational motion of a first motion transfer element;

a transmission operative to translate rotation of said first motion transfer element in said first direction into rotation of a second motion transfer element through a planetary gear set configured to selectively operate in a first configuration and a second configuration;

an output assembly operatively engaged with said second motion transfer element to rotate said head roller;

wherein said first configuration provides a first mechanical advantage and causes said second motion transfer element to rotate at a first speed; and

wherein said second configuration provides a second mechanical advantage and causes said second motion transfer element to rotate at a second speed.

35. The covering of claim 34, wherein said first motion transfer element is a first gear, and said second motion transfer element is a second gear.

36. The covering according to claims 34 or 35, wherein said input assembly further comprises:

a spool;

a pulley;

a shift arm;

a guide control arm; and

wherein said single operating element extends from said spool, partially around said pulley, across said shift arm, and exits said head rail assembly through said guide control arm.

37. The covering of claim 36, wherein said pulley is rotatably supported by said shift arm; and

wherein friction between said pulley and said shift arm causes said shift arm to pivot when said pull force is applied to said single operating element.

38. The covering of claim 37, wherein said shift arm includes a first leg portion and a second leg portion;

wherein said first leg portion is adapted to engage said transmission to control a rotational direction of said head roller; and

wherein said second leg portion is adapted to operatively engage said single operating element such that while a pull force is being applied to said single operating element and while said head roller is rotating said first direction, changing direction of said pull force from a first pull direction to a second pull direction does not cause said head roller to rotate in said second direction.

39. The covering claim 35, wherein said input assembly further comprises:

a spool;

a shift arm pivotally connected with said head rail assembly;

a guide control arm;

wherein said single operating element extends from said spool, across said shift arm, and exits said head rail assembly through said guide control arm; and

wherein a pull force imparted on said single operating element in a first pull direction causes said shift arm to pivot and engage said transmission, causing said head roller to rotate in said first direction.

40. The covering of claim 39, said input assembly further comprising a spring operatively connected with said spool to automatically wind said single operating element onto said spool.

41. The covering of claim 35, said transmission further comprising:

a clutch selectively rotatably connecting said first gear with said second gear.

42. The covering according to claims 34 or 35, wherein said first mechanical advantage is greater than said second mechanical advantage, and wherein said first speed is less than said second speed.

43. A covering for an architectural opening comprising:

a head rail assembly;

at least one sheet of fabric;

a head roller rotatably supported by said head rail assembly and adapted to extend or

retract said at least one sheet upon rotation of said head roller in a first direction or a second direction;

a control system connected with said head rail assembly and adapted to rotate said head roller in said first direction and said second direction, said control system comprising:

an input assembly including a single operating element and operative to convert linear motion of said operating element into rotational motion of a first motion transfer element;

a transmission operative to translate rotation of said first motion transfer element into rotation of a second motion transfer element through a clutch and at least one third gear;

an output assembly operatively engaged with said second motion transfer element to rotate said head roller; and

wherein rotation of said first motion transfer element in said first direction engages said at least one third gear to activate said clutch to cause rotation of said second motion transfer element in said first direction; and

wherein said clutch is configured to allow rotation of said second motion transfer element in said first direction and second direction when said clutch is deactivated.

44. The covering of claim 43, wherein said first motion transfer element is a first gear, and said second motion transfer element is a second gear.

45. The covering according to claims 43 or 44, wherein said clutch comprises:

a clutch body having an open center adapted to receive an axle to rotatably support said clutch;

at least one leg connected with said clutch body; and

wherein said at least one third gear is adapted to engage said at least one leg to activate said clutch when said at least one third gear rotates in said first direction; and

wherein said at least one third gear is adapted to disengage from said at least one leg to activate said clutch when said at least one third gear rotates in said second direction.

46. The covering of claim 45, wherein a first frictional force between said clutch body and said axle prevents rotation of said body relative to said axle until said at least one third gear engages said at least one leg to activate said clutch, and

wherein said first frictional force overcomes a second frictional force between said at

least one third gear and said at least one leg to allow disengagement of said at least one third gear from said at least one leg.

47. The covering according to claims 43 or 44, wherein said input assembly further comprises:

- a spool;
- a pulley;
- a shift arm;
- a guide control arm; and

wherein said single operating element extends from said spool, partially around said pulley, across said shift arm, and exits said head rail assembly through said guide control arm.

48. The covering of claim 47, wherein said pulley is rotatably supported by said shift arm; and

wherein friction between said pulley and said shift arm causes said shift arm to pivot when said pull force is applied to said single operating element.

49. The covering of claim 48, wherein said shift arm includes a first leg portion and a second leg portion;

wherein said first leg portion is adapted to engage said transmission to control a rotational direction of said head roller; and

wherein said second leg portion is adapted to operatively engage said single operating element such that while a pull force is being applied to said single operating element and while said head roller is rotating said first direction, changing direction of said pull force from a first pull direction to a second pull direction does not cause said head roller to rotate in said second direction.

50. The covering claim 44, wherein said input assembly further comprises:

- a spool;
- a shift arm pivotally connected with said head rail assembly;
- a guide control arm;

wherein said single operating element extends from said spool, across said shift arm, and exits said head rail assembly through said guide control arm; and

wherein a pull force imparted on said single operating element in a first pull direction causes said shift arm to pivot and engage said transmission, causing said head roller to rotate in said first direction.

51. The covering of claim 50, said input assembly further comprising a spring operatively connected with said spool to automatically wind said single operating element onto said spool.

52. A covering for an architectural opening comprising:

a head rail assembly;

at least one sheet of fabric;

a head roller rotatably supported by said head rail assembly and adapted to extend or retract said at least one sheet upon rotation of said head roller in a first direction or a second direction;

a control system connected with said head rail assembly and adapted to rotate said head roller in said first direction and said second direction, said control system comprising:

an input assembly including a single operating element and operative to convert linear motion of said operating element into rotational motion of a first motion transfer element;

a transmission operative to translate rotation of said first motion transfer element into rotation of a second motion transfer element;

an output assembly operatively engaged with said second motion transfer element to rotate said head roller; and

wherein said input assembly is configured to engage said transmission to cause said head roller to rotate in said first direction when said operating element travels in a first path through said input assembly; and

wherein said input assembly is configured to engage said transmission to cause said head roller to rotate in a said second direction when said operating element travels in a second path through said input assembly.

53. The covering of claim 52, wherein said first motion transfer element is a first gear, and said second motion transfer element is a second gear.

54. The covering according to claims 52 or 53, wherein said input assembly further comprises:
- a spool;
 - a pulley;
 - a shift arm;
 - a guide control arm; and
- wherein said single operating element extends from said spool, partially around said pulley, across said shift arm, and exits said head rail assembly through said guide control arm.
55. The covering of claim 54, wherein said pulley is rotatably supported by said shift arm; and
- wherein friction between said pulley and said shift arm causes said shift arm to pivot when said pull force is applied to said single operating element.
56. The covering of claim 55, wherein said shift arm includes a first leg portion and a second leg portion;
- wherein said first leg portion is adapted to engage said transmission to control a rotational direction of said head roller; and
- wherein said second leg portion is adapted to operatively engage said single operating element such that while a pull force is being applied to said single operating element and while said head roller is rotating said first direction, changing direction of said pull force from a first pull direction to a second pull direction does not cause said head roller to rotate in said second direction.
57. The covering claim 53, wherein said input assembly further comprises:
- a spool;
 - a shift arm pivotally connected with said head rail assembly;
 - a guide control arm;
- wherein said single operating element extends from said spool, across said shift arm, and exits said head rail assembly through said guide control arm; and
- wherein a pull force imparted on said single operating element in a first pull direction causes said shift arm to pivot and engage said transmission, causing said head roller to rotate in said first direction.

58. The covering of claim 57, said input assembly further comprising a spring operatively connected with said spool to automatically wind said single operating element onto said spool.

59. The covering of claim 53, said transmission further comprising:
a clutch selectively rotatably connecting said first gear with said second gear; and
at least one third gear rotatably connecting said first gear with said second gear.

60. A covering for an architectural opening comprising:
a head rail assembly;
at least one sheet of fabric;
a head roller rotatably supported by said head rail assembly and adapted to extend or retract said at least one sheet upon rotation of said head roller in a first direction or a second direction;

a control system connected with said head rail assembly and adapted to rotate said head roller in said first direction and said second direction, said control system comprising:

an input assembly including a single operating element and operative to convert linear motion of said operating element into rotational motion of a first motion transfer element;

a transmission operative to translate rotation of said first motion transfer element into rotation of a second motion transfer element;

an output assembly operatively engaged with said second motion transfer element to rotate said head roller; and

wherein a pull force applied in a first pull direction imparted on said single operating element causes said head roller to rotate in said first direction.

wherein said input assembly is operative to allow a change in direction of said pull force on said single operating element while said head roller is rotating in said first direction without reversing rotation of said head roller.

61. The covering of claim 60, wherein said first motion transfer element is a first gear, and said second motion transfer element is a second gear.

62. The covering according to claims 60 or 61, wherein said input assembly further comprises:

a spool;
a pulley;
a shift arm;
a guide control arm; and

wherein said single operating element extends from said spool, partially around said pulley, across said shift arm, and exits said head rail assembly through said guide control arm.

63. The covering of claim 62, wherein said pulley is rotatably supported by said shift arm; and

wherein friction between said pulley and said shift arm causes said shift arm to pivot when said pull force is applied to said single operating element.

64. The covering of claim 63, wherein said shift arm includes a first leg portion and a second leg portion;

wherein said first leg portion is adapted to engage said transmission to control a rotational direction of said head roller; and

wherein said second leg portion is adapted to operatively engage said single operating element such that while said pull force is being applied to said single operating element and while said head roller is rotating said first direction, changing direction of said pull force from said first pull direction to a second pull direction does not cause said head roller to rotate in said second direction.

65. The covering claim 61, wherein said input assembly further comprises:

a spool;
a shift arm pivotally connected with said head rail assembly;
a guide control arm;

wherein said single operating element extends from said spool, across said shift arm, and exits said head rail assembly through said guide control arm; and

wherein said pull force imparted on said single operating element in said first pull direction causes said shift arm to pivot and engage said transmission.

66. The covering of claim 65, said input assembly further comprising a spring operatively connected with said spool to automatically wind said single operating element onto said spool.
67. The covering of claim 61, said transmission further comprising:
a clutch selectively rotatably connecting said first gear with said second gear; and
at least one third gear rotatably connecting said first gear with said second gear.
68. A covering for an architectural opening comprising:
a head rail assembly;
at least one sheet of fabric;
a head roller rotatably supported by said head rail assembly and adapted to extend or retract said at least one sheet upon rotation of said head roller in a first direction or a second direction;
a control system connected with said head rail assembly and adapted to rotate said head roller in said first direction and said second direction, said control system comprising:
an input assembly operative to convert linear motion of an operating element into rotational motion of a first motion transfer element;
a transmission operative to translate rotation of said first motion transfer element into rotation of a second motion transfer element through at least one third gear rotatably connected with a planet carrier;
an output assembly operatively engaged with said second motion transfer element to rotate said head roller;
wherein said input assembly includes a shift arm having a pawl adapted to engage ratchet teeth on said planet carrier when a pull force in a first pull direction is imparted on said single operating element; and
wherein said input assembly is configured to automatically retract said single operating element into said head rail assembly and disengage said pawl from said ratchet teeth when no pull force is applied to said single operating element.
69. The covering of claim 68, wherein said first motion transfer element is a first gear, and said second motion transfer element is a second gear.

70. The covering according to claims 68 or 69, wherein said input assembly further comprises:

- a spool;
- a pulley;
- a guide control arm; and

wherein said single operating element extends from said spool, partially around said pulley, across said shift arm, and exits said head rail assembly through said guide control arm.

71. The covering of claim 70, wherein said pulley is rotatably supported by said shift arm; and

wherein friction between said pulley and said shift arm causes said shift arm to pivot when said pull force is applied to said single operating element.

72. The covering of claim 71, wherein said shift arm includes a first leg portion and a second leg portion;

wherein said first leg portion is adapted to engage said transmission to control a rotational direction of said head roller; and

wherein said second leg portion is adapted to operatively engage said single operating element such that while said pull force is being applied to said single operating element and while said head roller is rotating said first direction, changing direction of said pull force from said first pull direction to a second pull direction does not cause said head roller to rotate in said second direction.

73. The covering claim 69, wherein said input assembly further comprises:

- a spool;
- a guide control arm;

wherein said shift arm is pivotally connected with said head rail assembly;

wherein said single operating element extends from said spool, across said shift arm, and exits said head rail assembly through said guide control arm; and

wherein a pull force imparted on said single operating element in a first pull direction causes said shift arm to pivot and engage said transmission, causing said head roller to rotate in said first direction.

74. The covering of claim 73, said input assembly further comprising a spring operatively connected with said spool to automatically wind said single operating element onto said spool.
75. The covering of claim 69, said transmission further comprising:
a clutch selectively rotatably connecting said first gear with said second gear.